

**Global Broadcast Service (GBS)/Battlefield Awareness  
and Data Dissemination (BADD)  
Phase I Final Technical Report  
Executive Summary**

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# GBS/BADD Phase I Final Technical Report

## Executive Summary

### Introduction

Defense Advanced Research Projects Agency (DARPA), under a five year Advanced Concept Technology Demonstration (ACTD) program known as Battlefield Awareness and Data Dissemination (BADD), is leading the development of an information management component for deployed strategic and tactical C4I systems. The BADD Program is organized into three phases. The developmental Phase I led to BADD participation in Army Advanced Warfighting Experiments (AWEs): Task Force XXI (TF XXI) and Division XXI (DIV XXI). Each of Phase II's three-stages will provide a user service: Wideband Delivery, Information Management and Battlefield Awareness. Phase III will transfer technology to the DoD Information Dissemination Management (IDM) program. Through BADD, the warfighter's ability to request, receive and process information, as well as the broadcast center's ability to disseminate the needed information, will be greatly enhanced.

### BADD ACTD Objectives

The primary objective of the BADD ACTD is to provide an information dissemination and management system that allows joint tactical systems to transmit and receive high-volume data by using cost-effective and commercially available technologies. Some of these technologies include: Global Broadcast Service (GBS), Asynchronous Transfer Mode (ATM), multimedia databases and their associated applications, uniform access to heterogeneous databases, automated information discovery, scaleable architecture, an efficient message handling system, single-source and multisource correlation, Signal Intelligence (SIGINT) product exploitation, information dissemination management, and situation and intelligence (INTEL) assessment.

### Architecture

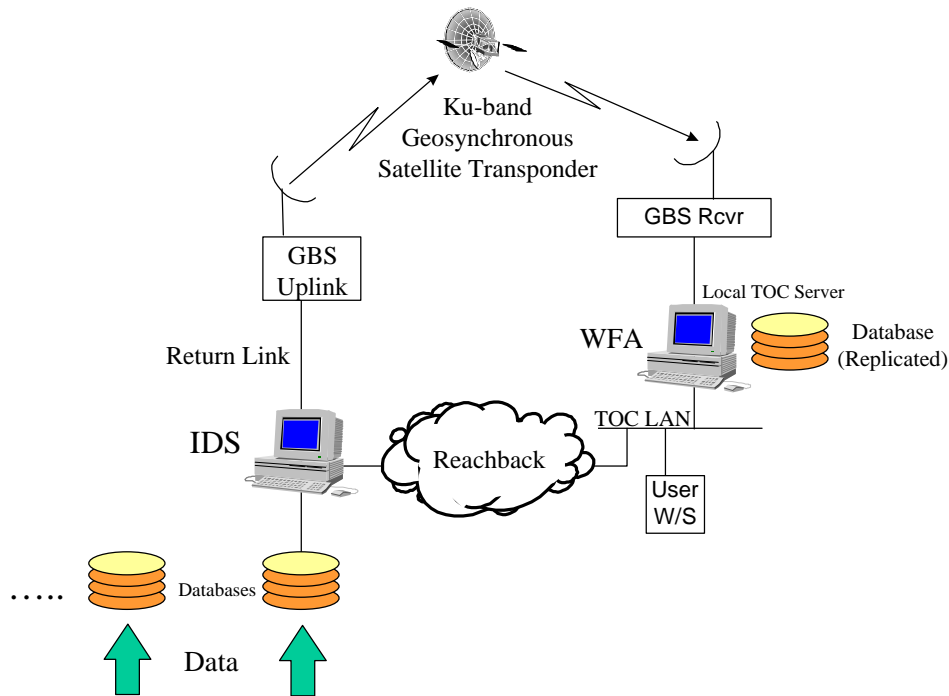
In the GBS/BADD architecture (see Figure 1), the Information Dissemination Server (IDS) disseminates information to the deployed warfighter within a tactical theater of operations. The IDS collects and evaluates information available in databases from national sources, as well as from theater sources. When the available information matches a warfighter's need posted via the **reachback link**, the IDS sends the information via the **return link** to a **GBS uplink** earth station for transmission to a satellite. The satellite broadcasts the information to the warfighter's downlink GBS receiver at the remote site.

At the receiving station, the broadcast data is deposited into a workstation local to the warfighter referred to as a Warfighter Associate (**WFA**). The WFA, among other functions, **replicates** the databases from which the information was drawn and functions as a **local server**. The data is then available to other **user workstations** via the Tactical Operations Center Local Area Networks (**TOC LANs**). The concept is for one receiving station, along with a server, to provide information for each LAN (in our case - each TOC). Types of information disseminated over GBS/BADD include data, imagery, maps, intelligence overlays, real-time video, weather, logistics data and battlespace status in any combination of video, voice and data (full multimedia presentation). The warfighter uses the existing military communication systems, to include Continental United States (CONUS) infrastructure and the tactical communications network, to

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transmit information requirements to the IDS. This reachback communication is restricted to very concise instructions, thus reducing the data flow on the tactical communication network.

# GBS/BADD Architecture



**Figure.1 GBS/BADD Architecture**

### Information Management

Information Management (IM) is emerging as a key technology requirement for managing huge volumes of multimedia data on the future battlefield. With IM tools, the commander can define mission data for the appropriate geographical, temporal and data type requirements.

The principal function of IM is to match available data with the warfighter's needs, without manually searching for this data to allow for focus on the tasks central to the mission. Another benefit is that superfluous information is filtered out, permitting the warfighter to focus only on critical data.

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A “smart push” of information refers to delivery of data which matches a “PROFILE” (see Figure 2) registered by the warfighter. In the BADD Phase I context, the warfighter submitted a profile by filling in a form on a displayed software window. The profile specified the overall data requirements for a present or future mission. This managed the information flow to be appearing in databases, i.e., present and future data.

The image shows a screenshot of a software window titled "Profile Editor". The window has a teal border and a light gray background. It is divided into several sections by horizontal lines. The first section contains two text input fields: "Name" with the value "Test" and "Author" with the value "MAJ WILK". The second section is titled "Time Of Interest" and contains two input fields: "Start Time" with the value "221730Z Nov 96" and "Duration (hrs)" with the value "12". The third section is titled "Area Of Interest" and contains two input fields: "Upper Left" with the value "35°27'36"N 116°29'37"W" and "Lower Right" with the value "35°26'41"N 116°26'38"W". To the right of these two fields is a button labeled "DRAW AOI". The fourth section is titled "Data Types" and contains a grid of nine checkboxes, each followed by a label: "MTI", "MTI Track", "UAV Video", "UAV Telemetry", "P3 Video", "P3 Telemetry", "UNI Video", "Whiteboard", and "3D Video". All checkboxes are currently unchecked. At the bottom of the window are two buttons: "Send" and "Cancel".

Profile Editor		
Name	Test	
Author	MAJ WILK	
Time Of Interest		
Start Time	221730Z Nov 96	
Duration (hrs)	12	
Area Of Interest		
Upper Left	35°27'36"N 116°29'37"W	
Lower Right	35°26'41"N 116°26'38"W	
DRAW AOI		
Data Types		
<input type="checkbox"/> MTI	<input type="checkbox"/> MTI Track	<input type="checkbox"/> UAV Video
<input type="checkbox"/> UAV Telemetry	<input type="checkbox"/> P3 Video	<input type="checkbox"/> P3 Telemetry
<input type="checkbox"/> UNI Video	<input type="checkbox"/> Whiteboard	<input type="checkbox"/> 3D Video
Send Cancel		

Figure 2. Profile Editor

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To obtain data that is not already locally available, a “warfighter pull” of information permits the warfighter to request specific data from the network. In the BADD Phase I context, the “QUERY” accomplished this. It was used to request historical data that currently exists in databases

### **Accomplishments**

The Task Force XXI AWE was a very important benchmark for the Army’s effort to digitize the battlefield. The accomplishments of the GBS/BADD program were instrumental in developing our understanding of the merits and issues associated with employing information management and wideband dissemination at tactical echelons. GBS/BADD provided the maneuver Battalions with unprecedented access to information; information that proved critical to their success in executing their missions. The maneuver Battalions considered GBS/BADD, as a major provider of information at this echelon, a superstar. Most important to the commander was MTI radar data that allowed him to “see the enemy in motion” -- with precise location and movement information. The battle staff also found UAV video dissemination to the Battalion TOCs very valuable.

#### ***(1) COMBINED LOW-COST BROADCAST CAPABILITY VIA GBS WITH AN INFORMATION MANAGEMENT SYSTEM***

Leveraging the low cost consumer direct-to-home entertainment system, we successfully demonstrated real-time video and encrypted wideband data with an information management system, which made the massive amounts of information available to the warfighter more intelligible and relevant to the mission.

#### ***(2) DEVELOPED A TACTICAL REPOSITORY FOR IMAGERY WITH TIME/SPACE ATTRIBUTES USING METADATA***

Using a Common Ground Station/Prototype (CGS/P) receive workstation, the UAV provided battlefield video clips which were passed to the local TOC server, the WFA. The video clips were stored in a database located at the remote IDS, and the frames were served to the requesting client. The UAV flight path and field of view polygons were displayed on the map background and correlated with video clips captured from the analog video from the camera. The warfighter could be very precise in selecting exactly the view to be analyzed. The UAV and MTI data were disseminated in near real time, subject to only minor processing delays associated with creating the database files and the GBS communications link propagation delay.

#### ***(3) PROVIDED STORAGE, RETRIEVAL, AND DISSEMINATION OF DATA***

The BADD IDS and WFA provided the means to store, retrieve and disseminate data received from various information sources including the UAV video, Battlefield Video Teleconference

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(BVTC), Improved Meteorological System (IMETS) weather data and All Source Analysis System (ASAS) intelligence data throughout the battlefield.

#### ***(4) DISPLAYED A CORRELATED VIEW OF THE BATTLESPACE***

The BADD WFA, through its links to other Army Battle Command Systems (ABCS) workstations, displayed a correlated view of the battlespace. The red/blue force situation awareness display was overlaid with UAV video from the CGS/P and MTI data from the Joint Surveillance Target Attack Radar System (JSTARS) downlink to the CGS/P.

Additional capabilities such as one-way BVTC and collaborative (whiteboard) planning for communicating commander's intent, and broadcast of IMETS weather data via a proxy home page further enhanced battlefield awareness.

#### ***(5) MATCHED AVAILABLE DATA WITH WARFIGHTER NEEDS***

Based on his settings of the profile and queries, the warfighters' need for information is established. From these inquiries, the local TOC server (WFA) and the IDS (along with the associated databases/repositories) serviced these requests. The ability to set display filters to show only the data needed based on the three attributes of space, time and data type was demonstrated. This capability reduces display clutter and information overload of the warfighter.

### **Lessons Learned**

The need for expanding the existing communications bandwidth by 100 to 1,000 times for multimedia information delivery at echelons down to the maneuver Battalion has been proven to be essential for the battlefield of the future. Information Dissemination Management (IDM) will enable a multimedia capability for the warfighter. There is a need for more extensive access to multimedia battlefield products including near real time video, imagery and other sensor products and access to large databases

The Army learned from executing the AWE's that in-theater injection is mandatory. Connecting in-theater data sources to a commercial communication infrastructure, thus moving data 6,000 km to a remote broadcast uplink to get it to the user 150 km from the data sources, is unnecessarily cumbersome. IDM will be essential to the success of the fielding of GBS, and to standing up the First Digitized Force as GBS is made an extension of the DISN infrastructure.

The locations of data sources on the battlefield can be diverse. This presents the real challenge that has yet to be addressed of transporting the data from the source to the GBS injection site. For instance, the CGS was located at the Brigade level in TF XXI, whereas the Theater Injection Point terminal is expected to be a joint asset located at the Corps level for a Joint Task Force (JTF).

There remains a need to stand up tactical repositories containing the source information derived within the theater of operations. It must be made clear that in executing the Phase I ACTD, we

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manufactured a tactical repository to enable the demonstrations. The BADD ACTD was not intended to be a repository project. Rather, BADD looks into all of the available information sources, whether in theater or national and matched information availability with warfighter needs. For the immediate future the CGS data, whose dissemination was central to the operational success of BADD Phase I, does not have the means of digitizing and storing the information, to then be disseminated and viewed in accordance with a commonly accepted scheme.

The GBS/BADD capability should be incorporated into the digital design as a “user owned and operated” capability, where the information management services are embedded into the operating environment of existing workstations, and other applications are available for integration into Battlefield Functional Areas (BFAs) that require those capabilities. The need for a TOC Warfighter Information Server has been long speculated, and some concept of this is described in the Warfighter Information Network - Terrestrial (WIN-T) Proof of Concept document.<sup>1</sup> The ownership, implementation and location of this server function is debatable, and requires more extensive consideration to allow a rational approach for integrating IDM into the future battlefield digital architecture.

### **Conclusion**

The GBS/BADD Phase I ACTD fielded a rapid prototype capability which demonstrated the value of multimedia information delivery into TOCs at Brigade and Battalion levels, and the intelligent presentation of that data to the warfighter. Information Dissemination Management technology is the key enabler to provide this capability. A strategy needs to be implemented very soon that results in an Operational Requirements Document (ORD) and Program Objectives Memorandum input authorized to fund the integration of Information Dissemination Management into the Digitized Army. BADD has the potential to be a great asset on the battlefield, with proper coordination and planning. A question remains at this point whether this capability will be implemented in time for the First Digitized Force in September 2000.

### **WORLD WIDE WEB ACCESS**

This report, the complete Final Technical Report, references, architecture and related material is accessible via the world wide web. The address is :

<http://www.monmouth.army.mil/cecom/rdec/isio/isio.htm>

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<sup>1</sup> Warfighter Information Network Master Plan, U.S. Army TRADOC,  
<http://www.sysarch.gordon.army.mil/>